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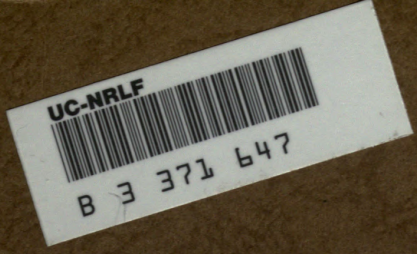

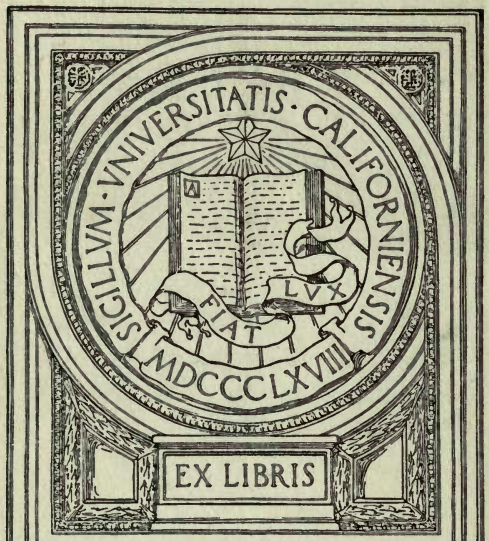
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The Mosquitoes or Culicidae of Jamaica.

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THE MOSQUITOES OR CULICIDAE OF JAMAICA.

BY

FRED. V. THEOBALD, M.A. CANTAB.,

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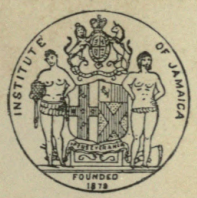
WITH

DESCRIPTIONS OF SOME OF THE VARIOUS STAGES

BY

M. GRABHAM, M.A., M.B. CANTAB.,

GOVERNMENT MEDICAL SERVICE, JAMAICA.



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January, 1905.

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THE

MOSQUITOES OR CULICIDAE OF JAMAICA.

As something like finality has been reached in regard to the mosquitoes of this island through the energy and ability of Dr. Grabham, I propose to issue a complete account of them for the reference of those working on such diseases as they are connected with in this and neighbouring islands. The fact that we have all three of the worst mosquito-borne diseases here and in the neighbouring islands, namely malaria, filariasis, and now and then yellow fever (the latter luckily almost stamped out through the energetic work of Americans), makes this subject of vital importance to those connected with the West Indies, otherwise than Jamaica. Previous to 1899 little or nothing was known of the Jamaican *Culicidae*. In my Monograph * issued in 1901 nine species were recorded and one variety, four of which were new to science. The four previously known species were *Anopheles argyrotarsis*, R.-Desvoidy, *Stegomyia fasciata*, Fabricius, *Culex fatigans*, Wiedemann, and *Culex confirmatus*, Arribalzaga, but none of these had been recorded from the island. The new species added were *Anopheles Grabhamii*, *Culex jamaicensis*, *Culex atratus*, *Culex* (*Stegomyia ?*) *Walkeri*, and *Deinocerites cancer*.

In Vol. II. of the Monograph † *Anopheles Grabhamii* was taken as the type of a new genus for which I proposed the name *Cyclolepteron*, owing to the curious rounded black scales on the wings.

Another new *Culex*, *Culex secutor*, was also described in the Appendix (p. 321), and also a new *Uranotaenia*, *Uranotaenia socialis* (p. 340).

* A Monograph of the Culicidae of the World, 2 vols., and 1 Atlas of Plates, 1901; vol. iii., 1903.

† App., p. 312.

In Vol. III. of the same Monograph, issued in 1903, the genus *Cycloleppteron* was more fully detailed (p. 55), and an account of its life-history given. Some slight errors crept in here, which I now wish to rectify. *Anopheles argyrotarsis* was placed in the new genus *Cellia*. The following new species of *Culex* were added to the Jamaican fauna—*Culex janitor* (p. 183), and *Culex similis* (p. 207). *Culex atratus* was placed in a new genus which I named *Melanoconion* (p. 238), *Culex jamaicensis* in the new genus *Grabhamia*, and to this genus two other species were added—*Grabhamia pygmaea* (p. 245) and *G. sollicitans*, Walker (p. 247). Another new record was *Mansonia titillans*, Walker. *Culex Walkeri* was placed, on further examination, in the genus *Howardina* (p. 287), which at that time was thought to be an *Aedine*. Thus by April, 1903, the known Culicid fauna had increased to sixteen definite species.

In November, 1903, *Culex tortilis*, and a new species of *Haemagogus*, *H. equinus*, were described (Entomologist, Nov. 1903, p. 281).

Since that date Dr. Grabham has sent me *Arribalzagia maculipes*, Theobald, *Cellia albipes*, Theobald, *Anopheles punctipennis*, Say, and *Uranotaenia Lowii*, Theobald.

In this paper I describe a new *Dendromyia*, thus bringing the total known species of Jamaica up to twenty-five.

There are a good many more West Indian forms not found in Jamaica. Some I feel sure may occur there, but judging from our present knowledge there seems to be a decided difference between the Culicid fauna of many of the islands, notably between Trinidad and Jamaica, the former approaching that of South America, the latter the south of North America, with its *Grabhamias* and *Culices*; nevertheless a southern genus, *Haemagogus*, creeps into the Jamaican fauna.

FRED. V. THEOBALD.

January, 1905.

SYNOPTIC TABLE OF SUB-FAMILIES.

Palpi long in both sexes. Head and scutellum never completely covered with flat scales, ♂ palpi clubbed at the apex. First fork-cell long..... *Anophelinae.*
Palpi long in the ♂, short in the ♀, and metanotum nude. First fork-cell large..... *Culicinae.*
Palpi short in both sexes ..... *Aedinae.*

SYNOPTIC TABLE OF GENERA.

Sub-family Anophelinae.

Head with upright forked scales only; thorax and abdomen with hair-like curved scales; wings with lanceolate vein-scales..... *Anopheles.* Meigen.
Head with upright forked scales only; thorax with curved hair-like scales and a few narrow curved ones in front; abdomen with large lateral scale tufts. Palpi densely scaled ..... *Arribalzagia.* Theobald.
Head with broad upright forked scales; thorax with flat spindle-shaped scales; abdomen more or less covered with either long narrow curved or spindle-shaped scales and with lateral scale tufts ..... *Cellia.* Theobald.
Head and thorax and body as *Anopheles;* but the wings with numerous inflated black scales ..... *Cycloleppteron.* Theobald.

Sub-family Culicinae.

Head and scutellum with flat scales..... *Stegomyia.* Theobald.
Head with flat and narrow-curved scales, latter forming median area. Scutellar scales narrow and curved ..... *Howardina.* Theobald.
Head and scutellum with narrow curved scales—
  Wing scales small, lateral vein scales linear *Culex.* Linnaeus.
  Wing scales small, the apical area of wing with short broad scales; small dark species..... *Melanoconion.* Theobald.
  Wing scales mottled; mostly short and broad, also with linear lateral scales..... *Grabhamia.* Theobald.
  Wing scales dense, often mottled, as very broad plates ending asymmetrically..... *Mansonia.* Blanchard.

Sub-family AEDINAE.

First sub-marginal cell very small, always much smaller than second posterior cell..... *Uranotaenia.* Arribalzaga.

First sub-marginal cell of normal size—

Antennae very long, not plumose in male. Second joint longer than others..... *Deinocerites.* Theobald.

Antennae of normal size, but not plumose in the male—

Metanotum with chaetae; wing scales thickish apically ..... *Dendromyia.* Theobald.

Metanotum with chaetae; wing scales narrow..... *Wyeomyia.* Theobald.

Metanotum nude, rather large metallic species..... *Haemagogus.* Williston.

SYNONYMIC LIST OF JAMAICAN SPECIES.

ANOPHELINAE.

1. *Anopheles punctipennis.* Say (1823).
   Culex hyemalis. Fitch.
2. *Arribalzagia maculipes.* Theobald (1903).
3. *Cellia argyrotarsis.* Robineau-Desvoidy (1828).
   Anopheles argyrotarsis. Robineau-Desvoidy (1828).
   Anopheles albitarsis. Arribalzaga (1891).
   Anopheles albimanus. Wiedemann (1828) (?).
4. *Cellia albipes.* Theobald (1903).
   Cellia argyrotarsis, sub-sp. *albipes.* Theobald (1901).
5. *Cyclolepteron Grabhamii.* Theobald (1901).
   Anopheles Grabhamii. Theobald (1901).

CULICINAE.

6. *Stegomyia fasciata.* Fabricius (1805).
   Culex fasciatus. Fabricius (1805).
   Culex calopus. Meigen (1818).
   Culex frater. Robineau-Desvoidy (1827).
   Culex taeniatus. Wiedemann (1828).
   Culex Konoupi. Brulle (1832).
   Culex formosus. Walker (1848).
   Culex excitans. Walker (1848).
   Culex viridifrons. Walker (1848).
   Culex inexorabilis. Walker (1848).
   Culex annulitarsis. Macquart (1848).
   Culex zonatipes. Walker.
   Culex exagitans. Walker (1856).
   Culex impatibilis. Walker (1860).
   Culex Bancroftii. Skuse (1886).
   Culex mosquito. Arribalzaga (1891).

Culex elegans. Ficalbi (1896).
Culex Rossii. Giles (1899).
6a. *Stegomyia fasciata.* Fabricius.
var. *mosquito.* Robineau-Desvoidy (1828).
7. *Howardina Walkeri.* Theobald (1901).
Culex (*Stegomyia*?) *Walkeri.* Theobald (1901).
8. *Culex taeniorhynchus.* Wiedemann (1821).
9. *Culex secutor.* Theobald (1901).
10. *Culex janitor.* Theobald (1903).
11. *Culex confirmatus.* Arribalzaga (1891).
12. *Culex tortilis.* Theobald (1903).
13. *Culex similis.* Theobald (1903).
14. *Culex fatigans.* Wiedemann (1828).
Culex aestuans. Wiedemann (1828).
Culex pallipes. Meigen (1838).
Culex auxifer. Bigot (1858).
Culex Macleayi. Skuse (1886).
Heteronycha dolosa. Arribalzaga (1896).
Culex Skusii. Giles (1899).
? *Culex pungens.* Wiedemann (1828).
15. *Melanoconion atratus.* Theobald (1901).
Culex atratus. Theobald (1901).
16. *Grabhamia jamaicensis.* Theobald (1901).
Culex jamaicensis. Theobald (1901).
17. *Grabhamia pygmaea.* Theobald (1903).
18. *Grabhamia sollicitans.* Walker (1856).
Culex sollicitans. Walker (1856).
19. *Mansonia titillans.* Walker.
Culex titillans. Walker.
Taeniorhynchus taeniorhynchus. Arribalzaga (1891).

AEDINAE.

20. *Uranotaenia socialis.* Theobald (1901).
21. *Deinocerites cancer.* Theobald (1901).
22. *Haemagogus equinus.* Theobald (1903).
23. *Dendromyia Mitchellii.* nov. spec.
24. *Wyeomyia Grayii.* Theobald.
25. *Uranotaenia Lowii.* Theobald (1901).

SYNOPTIC TABLE OF JAMAICAN SPECIES.

ANOPHELINAE.

Legs unbanded and immaculate	*punctipennis.* Say.	1
Legs spotted	*maculipes.* Theobald.	2
Legs with three hind tarsi pure white...	*argyrotarsis.* R.-Desvoidy.	3
Legs with three hind tarsi white, except for narrow basal black band on apical segment	*albipes.* Theobald.	4
Legs with narrow basal pale bands; wings with spots of black scales.....	*Grabhamii.* Theobald.	5

Culicinae.

Genus Stegomyia.

Tarsi with basal white bands; proboscis unbanded; thorax with lateral curved silvery lines and two median yellow ones ..... *fasciata.* Fabricius. 6

Thorax with two median yellow lines ... var. *mosquito.* R.-Desvoidy. 6A

Genus Howardina.

Fore and mid legs unbanded; hind with basal white bands. Thorax with lateral silvery-white areas ..... *Walkeri.* Theobald. 7

Genus Culex.

Legs with basal white bands; proboscis banded; thorax unadorned..... *taeniorhynchus.* Wiedemann. 8

Legs with narrow pale bands, mostly basal on hind pair only—

Abdomen banded in ♀ ..... *secutor.* Theobald. 9

Abdomen unbanded in ♀ ..... *janitor.* Theobald. 10

Legs unbanded—

Thorax adorned—

Thorax with median pale grey area... *confirmatus.* Arribalzaga. 11

Thorax with golden scales and a large dark patch on each side in front, abdomen unbanded ..... *tortilis.* Theobald. 12

Thorax unadorned—

Thorax reddish-brown, with very minute dull golden-brown scales and a few black ones ..... *similis.* Theobald. 13

Thorax as above, but with larger narrow-curved scales, and two more or less distinct median bare lines..... *fatigans.* Wiedemann. 14

Genus Melanoconion.

Small, black gnats; legs unbanded; abdomen with basal white spots ..... *atratus.* Theobald. 15

Genus Grabhamia.

Wing scales mottled; fork-cells short; legs mottled and banded; abdomen with apical pale triangular patches of creamy scales; wings with small black spot in third long vein ..... *jamaicensis.* Theobald. 16

Thorax with dark brown spots; about half the size of former species ..... *pygmaea.* Theobald. 17

Abdomen with median pale line; thorax clothed with golden curved scales; pleurae white..... *sollicitans.* Walker. 18

Genus MANSONIA.

Wing scales large and broad and asymmetrical; proboscis and legs banded and mottled ..... *titillans.* Walker. 19

AEDINAE.

α Metanotum nude. β Antennae of ♂ plumose.

Genus URANOTAENIA.*

First fork-cell very small; thorax chestnut brown, with a metallic mauve median line and a similar patch at the root of each wing and a small median one on scutellum. Legs unbanded, white knee spot and tibial spot. Antennae of ♂ plumose ..... *socialis.* Theobald. 20

ββ Antennae of ♂ pilose.

Genus DEINOCERITES.

First fork-cell long; thorax brown, abdomen blackish-brown. Legs unbanded. Antennae very long, second segment very long; pilose in ♂ and ♀ ... *cancer.* Theobald. 21

Genus HAEMAGOGUS.

First fork-cell long; of general metallic hue; thorax metallic green; pleurae white; abdomen metallic violet, with three prominent and one faint silvery white basal bands and lateral spots ... *equinus.* Theobald. 22

αα Metanotum with chaetae.

Genus DENDROMYIA.

Thorax brown with white pleurae, abdomen black above, dull-white below. Legs brown, with the last three mid tarsi white on one side..... *jamaicensis.* nov. spec. 23

Genus WYEOMYIA.

Thorax brown with white pleurae, abdomen ochreous below, black above. Legs black; coxae ochreous and also venter of femora ..... *Grayii.* Theobald. 24

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* *Uranotaenia Lowii*, Theobald, has recently been found in Jamaica. It can be told from the former by the white apices of the hind legs.

GENERAL ACCOUNT OF THE SPECIES FOUND IN THE ISLAND.

1. Anopheles punctipennis. Say.

(*The Winter Mosquito.*)

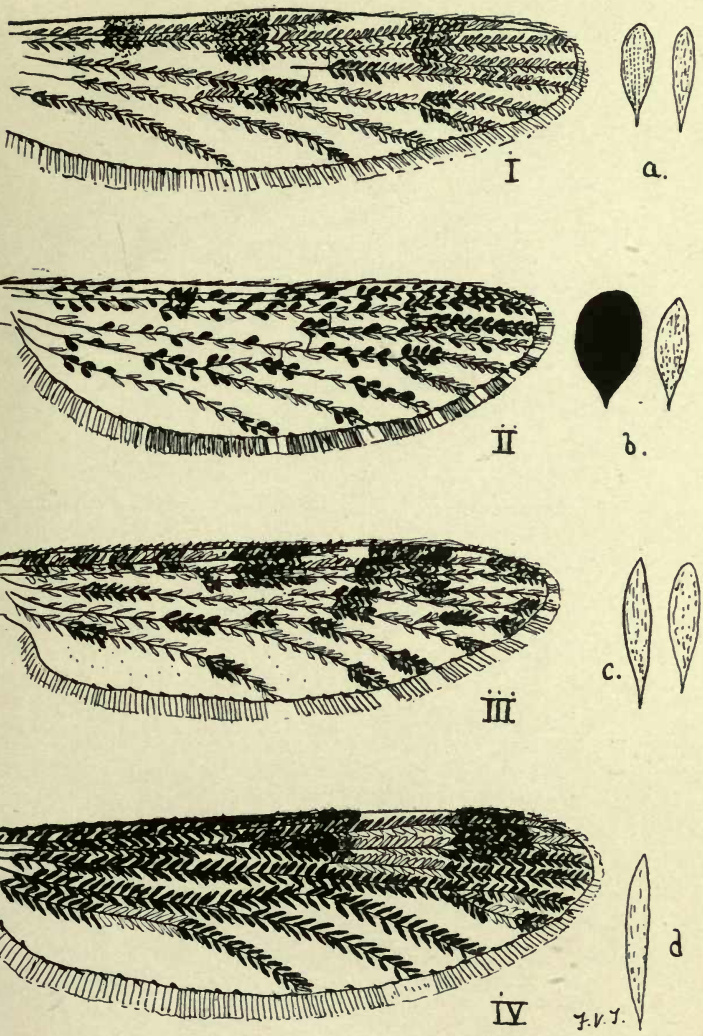
(Journ. Acad. Nat. Sc., Philadelphia, III., 1823; Mono. Culicid. I., p. 189, 1901.)

General appearance.—Head covered with black upright forked scales, with a small patch of white ones in front. Palpi with brown scales, a narrow grey band basally and a greyish tip with a broader band between, banding seen only in some lights, in others the palpi are all dark brown. Thorax deep chestnut-brown, with a median broad patch of silvery-grey, covered with scanty pale golden narrow curved scales. Abdomen dark, blackish-brown, with scattered golden hairs, dull grey at the base of the segments in some specimens. Legs brown, knees and tips of tibiae yellow, wings with the costa almost black, with two yellow spots, one at the apex, another on the apical third, which is large and prominent and spreads as a band on to the wing field, most of the rest of the wing dark-scaled, except for a yellow spot on the middle of each branch of the second fork-cell and another in the middle of the sixth long vein.

Length.—5 mm.

Geographical distribution.—Abundant in the eastern United States. It has occurred in Jamaica at Port Antonio (Professor Johnson and Dr. Moseley), but is seemingly rare there. The specimen sent me by Dr. Grabham was quite normal. It has probably been introduced and does not appear to occur elsewhere in the island. This is the only true *Anopheles* found in the West Indies.

Life-history and habits.—The larva has a rounded brown head; the mid frontal hairs are simple, the lateral branched. Between the antennae are six plumose hairs, and between the latter, nine more or less distinct pigmented spots, the largest in the centre, the others arranged around it. Antenna of two segments, the first short and immovable, the second elongate and bears two rather long spines and two short ones and a 6-branched



WINGS OF JAMAICAN ANOPHELINAE.

I. *Arribalzagia maculipes.* Theobald. (*a*) Wing scales.
II. *Cycloleppteron Grabhamii.* Theobald. (*b*) Wing scales.
III. *Cellia argyrotarsis.* Robineau-Desvoidy. (*c*) Wing scales.
IV. *Anopheles punctipennis.* Say. (*d*) Wing scales.

hair; about one-third of the length from the base is a branched hair. Thorax rounded, twelve long plumose hairs and some smaller ones and several single hairs. Abdomen of nine segments, the first two rings have two long feathered hairs on each side, the third has one, the fourth and fifth with three or four simple hairs united at their base on each side, the sixth, seventh and eighth with but one or two; besides these there are two or three short feathered hairs and several short simple ones on each side of the segments. Palmate hairs on segments three to seven; comb with about seven long teeth, and between each, one to four, shorter ones. Pupa with no special features.

Economic importance.—This *Anopheles* bites somewhat severely. So far it has not been connected with malaria, but probably it has the same importance as *A. maculipennis.*

2. Arribalzagia maculipes. Theobald.

(*The Spotted-legged Mosquito.*)

(Mono. Culicid. III., p. 81, 1903.)

General appearance.—Head with deep brown and grey upright forked scales, the dark ones grey at the tips. Palpi densely black-scaled with three narrow white-scaled bands, a white apex and a few scattered white scales. Thorax brown with slaty-grey sheen showing brown longitudinal lines, small brown specks and narrow-curved golden hair-like scales. Abdomen black, with deep brown and golden-brown hairs, dorsum nude, each segment with an apical lateral tuft of black scales and a few white ones on the apical tufts; venter with many white and black flat scales and also a few on the apical segment. Legs deep brown banded and spotted with white to yellow, sometimes almost golden scales. Wings mostly black scaled with a few yellow patches, upper border dark with several small yellow spots.

Length.—6·5 mm.

Geographical distribution.—Abundant about Rio de Janeiro and at Saõ Paulo, Brazil. I have also received specimens from Trinidad. In Jamaica it has occurred at Port Antonio, where Dr. Grabham has taken a few specimens at the border of the swamp near the Folly Point. Specimens have also been found at Morant Bay by Dr. Bartlett.

Life-history.—The egg, larva and pupa are at present unknown.

Economic importance.—It is undoubtedly a malaria carrier, according to Dr. Lutz.

3. Cellia argyrotarsis. Robineau-Desvoidy.

(*The Swamp Mosquito.*)

(Essai sur les Culicid., p. 411, Rob.-Desvoidy; Dipt. Argentina, p. 36, Arribalzaga; Mono. Culicid. I., p. 123, and III., p. 110, Theobald.)

General appearance.—Head black, with white upright scales in front, black behind and at the sides. Palpi covered with long black scales, apex pure white and two other narrow white rings. Thorax with bluish-grey sheen, with three more or less distinct longitudinal dark lines, with pale scales scattered over the surface. Abdomen dusky purplish-brown with creamy-yellow scales, especially in the middle of the segments, lateral tufts of dark grey scales projecting from the sides. Legs dark brown; first two tarsi of fore legs apically white, also metatarsus, in the mid-legs the same, but also traces on the last two segments of pale bands; last three segments and apex of the next pure white in the hind legs. Wings with the costa dark, with four distinct and several small white patches, wing field with dark and light patches, which vary in extent.

Length.—4 to 5 mm.

Geographical distribution.—All the West Indian Islands and many parts of South America. It is uncommon in Jamaica. Dr. Grabham sent me some in 1900, but I have received none since. These were taken in 1899 by Dr. Grabham, who recently writes that he has not met with the species again since that date.

Life-history.—Dr. Grabham bred this insect from larvae taken from typical *Anopheles* pools at Rockfort, near Kingston, the mature insect appearing from November to March in this island. I am not aware that the larvae, &c., have been carefully examined for structural details.

Economic importance.—This mosquito has been proved to act as a transmitting agent of the bloodworm *Filaria nocturna* found in Barbadoes and in various tropical countries. Its bite is not particularly irritating, nor is the insect very bloodthirsty. It is found in swamps mostly, but may invade houses.

4. CELLIA ALBIPES. Theobald.

(*The Allied Swamp Mosquito.*)

(Mono. Culicid. I., p. 125, 1901, and III., p. 110, 1903.)

General appearance.—Resembles the preceding species, but can always be told by the last hind tarsus having a clear black basal band, which is quite constant.

Geographical distribution.—South America (in Brazil, British Guiana) and in all the West Indian Islands.

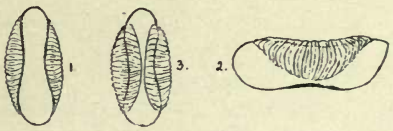
In Jamaica it is very common at the Ferry and Rockfort Swamps and over the Lignanea Plain. Dr. Grabham also records it from Bath, Bowden, Annotto Bay, Port Antonio, Bluefields, Castleton, and Spaldings.

Life-history and habits.—Breeding grounds very variable, such as rivers, large swamps, small swamps, irrigated cane-fields, ditches, trenches, canals, small water-ways and water holes and depressions made by the feet of cattle. Not only in fresh water, but also in salt water, for Dr. Low records it in a lagoon of water shut off from the sea by a bank of sand only ten yards wide, with no vegetation except some old seaweed—in fact, almost any natural collection of water may contain them. So far, none have been found in tubs, barrels, or any other artificial collection. The figures I gave in my monograph of the larval characters (p. 111, fig. 65) are *not* of this species, but probably of *C. argyrotarsis* sent with them, both larvae now and again occurring in the same pool. The descriptions given here of the egg, larva and pupa are drawn up by Dr. Grabham, who has followed them closely in development.

The Egg.—Eggs laid in batches of fifty to eighty arranged together side by side or in stellate groups on the surface of the water. Length, 0·4 mm., breadth, 0·2 mm., across the widest points of the floats. Upper surface dumb-bell-shaped. Fringe represented by a thickened ridge without striation. Floats of relatively large size, attachment to seven-eighths length of fringe. On the under surface floats nearly meet. Lower surface with irregular polygonal markings.

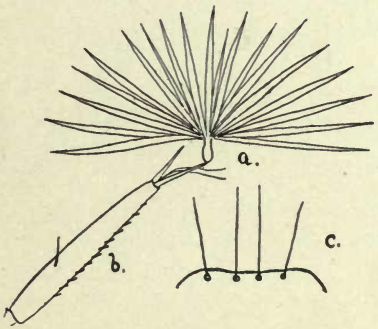
The larva.—Head with distinctive markings as in the figure (Plate 3, Fig. 1). Brushes when extended reach as far as the extremities of the antennae. Four simple hairs project over mouth, of nearly equal length, outer pair slightly longer (Plate 2, Fig. 2, c). A pair of small curved hairs on the edge of clypeus near the median line. Four plumose hairs arranged across the centre of

the head. Two smaller additional ones placed externally and more anteriorly. From the antero-lateral angles of the head a pair of plumose hairs spring on each side, the largest reaching to the distal third of the basal joint of the antenna. Antennae: basal joint upper two-thirds spiny — along the inner border especially. A simple short spine arises on the outer surface at the junction of the mid and lower thirds (Plate 2, Fig. 2, b). Surmounting the basal joint are two lanceolate laminae and a filamentous bifurcated hair, each lamina one-third length of basal joint. Maxillary palp (Plate 3, Fig. 1, b), half length of antennal basal joint; on the outer surface a short plumose hair, and on the upper surface a number of small stout spines. The palp is terminated by a wedge-shaped lamella and fine spines; two of these are much shorter than the other three. Mandible: four to six simple stout curved bristles forming a group at the outer angle with a number of smaller ones. The concave borders of some of the bristles are finely serrated. One large notched tooth followed on a lower plane by a series of denticles. A row of very slender simple hairs arises from the median border of the mandible. Lower lip of Meinert: pyramidal, consisting of seven to eight highly chitinous rounded teeth (Plate 3, Fig. 1, c). Thorax: several long plumose hairs, each supported by a pedicel, spring from the angles; on each pedicel there is also a short curved lateral spine; sometimes only the spine is present. These spines are not present on the abdominal pedicels. The anterior border is ornamented by a band of white pigment; a V-shaped conspicuous mass of pigment is generally present on the upper central surface; this is absent in some specimens. Abdomen: a pair of plumose hairs on the lateral borders of each of the first three segments. The following segments have only simple and small branched hairs. A pair of palmate hairs on each segment from the second to seventh inclusive. A pair of rudimentary palmate hairs on the first segment. Leaflets 12–16. Each leaflet simple, narrowly lanceolate, not shouldered (Plate 2, Fig. 2, a). Anal papillae: equal, ovate, one-third length of longest posterior bristles. Semilunar pigmented markings are usually found on the second and fifth abdominal segments. These may be only faintly represented or absent altogether. Occasionally a median dorsal band of brilliant white pigment extends from the respiratory stigmata to the thorax. Colour of adult larvae is usually bright green; sometimes dull olive green or orange grey.



Eggs of *Cellia albipes*. Theobald.

FIG. 1.



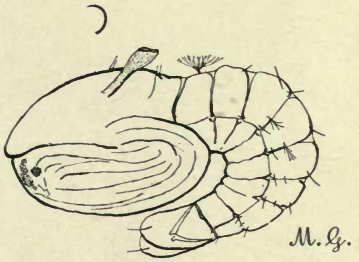
Larval characters of *Cellia albipes*. Theobald.

(*a*) Palmate hairs. (*b*) Antenna. (*c*) Frontal hairs of larva.

FIG. 2.

Larva of *Cellia albipes*. Theobald.

FIG. 3.



Pupa of *Cellia albipes*. Theobald.

FIG. 4.

The pupa.—A pair of large branching hairs spring from the posterior of the first abdominal segment; a pair of smaller branched hairs on the third and fourth segments. The second segment without these hairs (Plate 2, Fig. 4).

According to Dr. Low, the larval stage lasts from fifteen to eighteen days and the pupal stage two days.

Economic importance.—The adults bite by night and day. Dr. Low describes how great numbers came and bit him about midday when sitting under a mango tree in British Guiana. Dr. St. George Gray also wrote me that "when disturbed it will bite at any time of the day or night."

Not only does this species bite somewhat severely, but it acts as the intermediate host for the parasite of malignant malaria,* and also for the development of *Filaria nocturna*. On the other hand, it is inefficient for *Filaria demarquaii*.

5. Cyclolepteron Grabhamii. Theobald.

(*Grabham's Anopheles.*)

(Mono. Culicid. I., p. 205, 1901, and II., p. 312, 1901, and III., p. 56, 1903.)

General appearance.—Head black, with upright forked scales, white in the middle, black at the sides. Palpi all black, densely scaled. Thorax slaty-grey, with deep brown mottlings and two parallel brown lines in front. Two of the brown marks form more or less distinct eye-like spots, with hair-like golden curved scales.

Abdomen steely black, with curved golden hairs, brown hairs at the sides. Legs brown, femora and tibiae mottled with creamy scales; metatarsi and first two tarsi with narrow pale basal bands. Wings with dark grey and black scales, creamy ones on the third vein, a few on the lower branch of the first fork cell, on both branches of the second, many on the fifth and its branches, the sixth all creamy scaled except for a black spot at the base and near the apex; large black inflated scales form spots on the wing field.

Length.—5 mm.

Geographical distribution.—At present this species is only known in Jamaica and in Cuba. Dr. Grabham says he occasion-

* British Medical Journal, 25. 1. 02.

ally meets with it on the Lignanea Plain, and that some years it appears to be absent.

Life-history and habits.—This mosquito is an ardent blood-sucker. The larvae will live in any stagnant water, and will flourish in an infusion of decaying animal matter. The adult is found in March, April, and May most abundantly.

The egg.—Upper surface broad. Fringe is well developed at each end, represented by a beaded line at the attachment of the floats. Lower surface with roughly hexagonal depressions. Floats occupy middle half of ovum, and are widely separated below. The egg is rather longer and narrower than that of *Cellia albipes*. A figure of an egg-case is given. A captive female will readily lay eggs, depositing about fifty at a time. These are arranged side by side or in radiating groups of three or more together at the edge of the water. This stage lasts forty-eight hours.

The larva.—Colour varies greatly. Dull olive green and bluish grey shades prevail. The commonest type of ornamentation is shown in the diagram. On the thorax is a rough V-shaped mark, with its apex completed on the first abdominal segment. A snowy-white shield-shaped mark with five dark spots on it on the second and third segments, a small triangular one on the fourth, and on the fifth an oval mark with an irregular dark area in the centre. The frontal hairs are very marked. The median pair are simple and long. The lateral pair are bifid, each branch ending in a tuft of hairs. The palmate hairs are on the third to seventh segments inclusive. The leaflets are jagged at the edges, and vary from fifteen to twenty. The antennae are composed of two segments. The basal are very small, the large one with small scattered spines terminating in a bifurcated hair and in two long equal thorn-like spines and three small ones. The two large ones frequently lie side by side, and so look single. In living specimens the surface of the antennal segments is marked with an undulating pattern. The figure of the palmate hairs (no. 35, p. 58, vol. iii.) in my Monograph should show the leaflets jagged at the sides, and the antennal spine (Fig. 36a) should be double, and the outer frontal hairs bifid and tufted, and there are only five pairs of palmate hairs, not six.

Economic importance.—Beyond being an ardent blood-sucker, nothing is known of this insect. Probably it also is the definitive host of the malarial parasites.

6. Stegomyia fasciata. Fabricius.

(*The Tiger Mosquito, Spotted Day Mosquito, Brindled Mosquito*).

(Syst. Antl., 36. 13. 1805, Fabricius; Mono. Culicid. I., p. 289, 1901, Theobald.)

General appearance.—Head clothed with flat silvery-white and black scales; proboscis unbanded. Palpi blackish, with white apex. Thorax dark brown, with a curved silvery line on each side and two parallel yellow median lines. Pleurae with white spots; scutellum with flat white scales. Abdomen black, with basal white bands and white lateral spots. Legs black, metatarsi and tarsi with broad basal white bands, last hind tarsus pure white. Fore and mid ungues of ♀ equal, uniserrated, hind equal and simple; in ♂ fore and mid unequal, the larger of the fore uniserrated. Wings with brown scales; fork-cells short.

Length.—3·5 to 4·5 mm.

Geographical distribution.—Found in almost all countries and islands between latitudes 45° S. and N. of the Equator. Particularly abundant in south, central, and southern North America and the West Indies. A common insect in Jamaica.

Life-history and habits.—This species, which has been described under a variety of synonyms, is a day as well as a night flier, and is especially annoying in the afternoon. It has been noticed to be most so between the hours 1 P.M. to 3 P.M. It is essentially a domestic species, breeding in water barrels, tanks, tubs, wells, fountains, and any small collection of water around houses, even in empty tins and calabashes. Now and again specimens have been taken in the bush, but such is unusual. It is stated that the males bite as well as the females, but if this does happen it is very exceptional. The males have rudiments (sometimes quite advanced) of the piercing mouth-parts, and it is then quite possible for them to do so, but there are no authentic records. The adults can live some time in confinement. Dr. Bancroft has kept them two months or thereabouts. Pregnant females can thus travel great distances by boat or rail. The eggs also can withstand long desiccation. Some hatched out after two months seclusion in a dry test-tube.*

The adults appear over a large part of the year. The eggs are laid singly, they are oval in form and are covered with a complete reticulated membrane; there are no large air-cells, but

* Mono. Culicid. III., p. 143, 1903.

air is present in some of the reticulate spaces; their colour is black. Frequently they are laid in chains, about a quarter of an inch or more between each egg.

The *larva* differs from the typical *Culex* in that the air tube is short and thick, the head is smaller than the thorax and rounded, the antennae terminate in a bisegmented process and a spine and lateral and terminal bristles. The clypeus is rather pointed, anal fins four, oval, oblong, and short. They remain for long periods wriggling about at the bottom of the water, and then come slowly to the surface for air and soon go down again.

The *pupa* has rather short, trumpet-shaped siphons and broad anal fins; a stellate tuft on the dorsum of the first abdominal segment.

Economic importance.—Not only is the bite of this cosmopolitan insect very severe and annoying, but its important rôle is that of yellow fever carrier. It is an inefficient intermediate host for the *Filaria nocturna*.

6A. Stegomyia fasciata. Fabricius.

Var. *mosquito*. Robineau-Desvoidy.

General appearance.—Very similar to the type, but the two median yellow parallel thoracic lines are absent.

Geographical distribution.—Calcutta, St. Lucia, Brazil, Argentina and Jamaica.

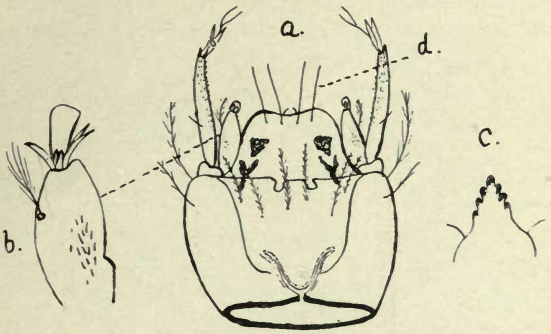
This is not the *Culex mosquito* of Arribalzaga, which is a typical *fasciata*.

7. Howardina Walkeri. Theobald.

(*The Wild-Pine Mosquito.*)

(Mono. Culicid. I., p. 424, 1901, and III., p. 287, 1903.)

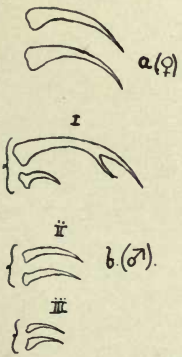
General appearance.—Head with a median line of silvery white scales, then a dark brown, and then pale brown areas. Proboscis long, deep brown. Thorax deep rich brown, with a lateral broad silvery-white area and two median golden-scaled lines running parallel in front and converging to form a single line behind and two other lines not reaching the front of the mesothorax. Abdomen deep brown, with some basal creamy



Larval characters of *Cellia albipes*. Theobald.

(*a*) Head. (*b*) Palp. (*c*) Mentum. (*d*) Frontal hairs.

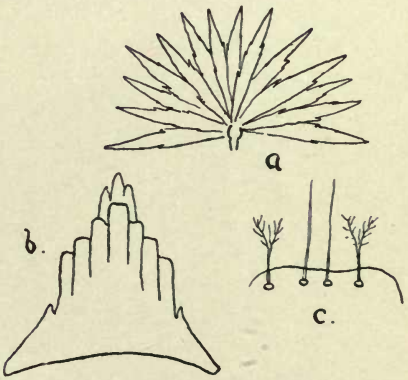
FIG. 1



Ungues of ♂ and ♀ *Cellia albipes*. Theobald.

(*a*) Front pair of ♀.
(*b*) Fore, mid and hind of ♂.

FIG. 2.



Cyclolepteron Grabhamii. Theobald.

Larval characters:

(*a*) Palmate hairs. (*b*) Mentum of larva.
(*c*) Frontal hairs.

FIG. 3.

median patches. Fore and mid legs unbanded; hind metatarsi and tarsi with basal white bands; ungues equal and simple. Wings with small fork-cells.

Length.—2·5 mm.

Geographical distribution.—So far only recorded from Jamaica.

Life-history.—The mature insect appears only in May and is evidently uncommon in the island. It comes in the genus *Howardina*, which belongs to the *Culicinae*, and not to the *Aedinae*.

The following is Dr. Grabham's account of the various stages:—

"The larva assumes a nearly vertical position in the water when resting at the surface film. Colour of head and siphon is light brown, of thorax and abdomen very dark grey; latter have a thick appearance owing to the presence of large tufted hairs. The abdominal segments have a ring of tufted hairs, about eight in number, at the apex and base. One to seven segments have paired lateral simple hairs.

"Pecten of tube composed of a row (extending nearly whole length of tube) of simple, slightly-curved bristles, about twenty in number.

"Chitinous ring of the ninth segment not complete ventrally; a peculiar digitate hair at the postero-inferior border articulated by a ball-and-socket facet, and terminating in eight to ten bristles; this appears to be an extra swimming paddle. Both upper and lower brushes of hairs few in number; lower brush arises from a diamond-shaped plate of chitin situated between the extremities of the incomplete chitinous ring.

"Antennae have the lateral hairs at junction of upper and middle thirds, terminal hairs short.

"Lower lip of Meinert rather flat, of nineteen to twenty teeth. Lateral combs of eighth segment of seven to eight stout bristles, each springing from a strong base; bristles curved inwards towards the points.

"Tufted hairs of five to twenty flattened trichae arranged in a rosette.

"Siphon nearly in same straight line as first seven segments; eighth and ninth segments curved away, siphon twice as long as broad.

"Larvae very timid, hurrying to bottom of jar on the slightest provocation; avoid light, are always on dark side of bottle. Length of pupa stage is nearly four days.

"The *Bromelias* in which larvae have been found are: *Tillandsia utriculata*, L., and *Caragauta ligulata*, Lindl."

Economic importance.—Beyond biting slightly, little or no economic importance is attached to this uncommon species.

8. Culex taeniorhynchus. Wiedemann.

(*The Banded-proboscis Mosquito.*)

(Dipt. Exot., p. 43, 1821; Mono. Culicid. I., p. 350, 1903.)

General appearance.—Thorax dark brown, covered with fairly close golden-brown scales. Palpi yellowish, covered with black scales, extreme apex white; proboscis black, with creamy white band about the middle. Abdomen black, with basal bands of creamy white scales and pure white lateral spots. Legs dark brown, tarsi and metatarsi with basal white bands, last hind tarsus pure white; tibiae with a few yellowish spots; fore and mid ungues of ♀ toothed; fore of ♂ unequal, the larger biserrated.

Length.—4·5 to 5 mm.

Geographical distribution.—Brazil; British Guiana; Honduras; Southern States of North America; St. Lucia; Trinidad; in Jamaica it occurs abundantly along the South Coast.

Life-history and habits.—This mosquito occurs in houses, hospitals, &c., and also in the open. It bites rather severely.

Structural parts of the larva are shown in figure. The figures of the larvae given by John B. Smith in Bulletin 171, New Jersey Agricultural Station, Feb. 8th, 1904, Plate VI., do not agree with those sent by Dr. Grabham. What species the latter belong to I do not know, but Dr. Grabham's belong undoubtedly to *C. taeniorhynchus*, Wiedemann.

Economic importance.—This species is a vicious biter in Jamaica, and is of particular importance on account of its frequency in seaside towns.

9. Culex secutor. Theobald.

(*The Mountain Mosquito.*)

(Mono. Culicid. II., p. 321, 1901.)

General appearance.—Head deep brown, with creamy gray narrow-curved scales in the middle, darker around the edge and

upright forked scales projecting out laterally. Thorax deep brown, covered with pale golden-brown scales with two prominent bare lines on the middle in front slightly expanding anteriorly. Abdomen almost black, with traces of white basal banding. Legs deep brown, the anterior and middle unbanded, the posterior with apical and basal banding; ungues of the ♀ small, equal and simple, proboscis with a narrow pale band on the apical half in the ♂, not in the ♀. There is also faint apical banding to the fore and mid legs, hind as in the ♀; fore and mid ungues unequal, the larger uniserrated; hind ones equal and simple.

Length.—4 to 4·5 mm.

Geographical distribution.—So far only recorded from Jamaica. It is an inland species, and is recorded from Cinchona and Mavis Bank, between 3,500 and 5,000 feet altitude; a few stray specimens have been taken by Dr. Grabham in the Red Hills and in Kingston.

Life-history and habits.—This inland species appears in great numbers at certain times, especially after heavy autumnal rains. Great numbers bred in the pools at the foot of the Red Hills near Kingston in the autumn of 1899. The adults have a slow and clumsy flight, and appear in clouds following one about. The following is Dr. Grabham's description of the adult larva:—

"Respiratory siphon many times longer than broad; double row of pecten consisting of twelve, four to five toothed spines, six to eight small hair-tufts at the upper posterior aspect of the tube.

"Lateral comb of simple short spines forty to sixty in number, arranged in a triangular patch; a large nine-branched tufted hair at the foot of the siphon behind. Chitinous collar completely encircling the ninth segment, saddle shaped; ventral tufts of hairs spring from a narrow prolongation backwards of the collar. Anal papillae three-fourths the length of longest ventral hairs, lanceolate, blunt at free ends. Dorsal tuft of six hairs, two of great length. Thoracic hairs plumose. Lower lip shown in figure. Lateral antennal tuft of numerous hairs at the junction of upper and lower thirds."

Economic importance.—This *Culex* is a persistent and vicious biter, and follows one about in dense clouds. It bites during the day and causes painful swellings.

10. Culex janitor. Theobald.

(*The False Crab-hole Mosquito.*)

(Mono. Culicid. III., p. 183, 1903.)

General appearance.—Head deep brown, with narrow-curved creamy scales in the middle, darker at the sides, and very pale yellow around the eyes; palpi black-scaled. Thorax deep brown, with rich umber brown narrow-curved scales, and with a slightly paler curved line on each side about the middle of the mesonotum (in some lights appear a median dark line, in others two median parallel lines).

Abdomen in ♀ unbanded, with small basal lateral white spots, venter with broad basal white bands. Fore and mid legs unbanded, hind legs with narrow bands, mostly basal, but to some extent involving the apex of the preceding segment. Ungues of female equal and simple; those of the fore and mid legs of the male unequal, uniserrated; hind equal and simple.

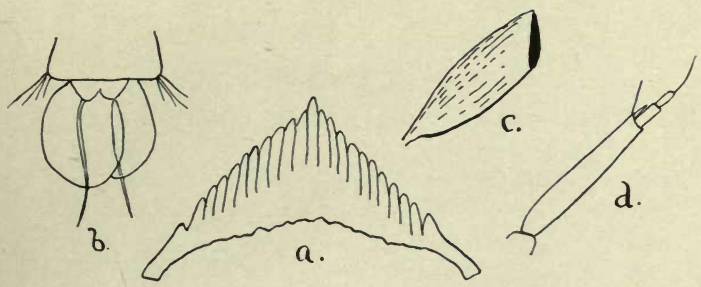
Male palpi brown, with a narrow pale band towards the base, two apical segments equal, both slightly paler at the base, with a few short hairs. Abdomen of male with three narrow pale bands on the basal segments, then two large basal spots not forming bands and a mass of dull grey scales on the apical segment. There are also traces of banding on the mid legs of the male.

Length.—5 mm.

Geographical distribution.—Jamaica, along coast line.

Life-history and habits.—Nothing is yet known of the larval and pupal stages. The adults occur congregated at the entrance of crab-holes with *Deinocerites cancer* by the seashore. They do not fly up and attack one, and are thought by Dr. Grabham to be nocturnal.

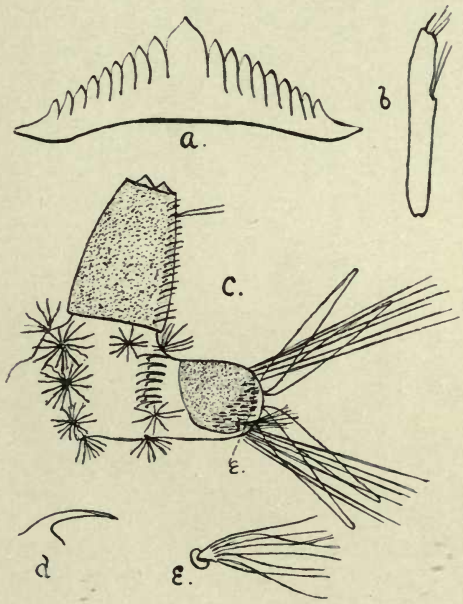
The species much resembles *C. secutor*, but can be told by the unbanded female abdomen and the male palpi having the two apical joints much shorter and stouter than in *secutor*. Moreover, its habits and distribution are different, the False Crab-hole Mosquito being littoral, the Mountain Mosquito an inland insect.



Stegomyia fasciata. Fabricius.

(*a*) Mentum of larva. (*b*) Caudal fins of pupa. (*c*) Siphon of pupa.
(*d*) Larval antenna.

FIG. 1.



Howardina Walkeri. Theobald.

Larval characters:

(*a*) Mentum. (*b*) Antenna. (*c*) Anal segments and siphon.
(*d*) Bristle of lateral comb. (*e*) Digitate hair, from posterior border of 9th segment.

FIG. 2.

11. Culex confirmatus. Arribalzagia.

(*The Pale-fronted Culex.*)

(Dipt. Argentina, p. 46, 1891; Mono. Culicid. II., p. 42, 1901.)

General appearance.—Head dark brown, clothed with pale creamy curved scales in the middle, and with ochraceous ones at the sides and behind. Proboscis black. Palpi black. Thorax with the front half clothed with pale silky yellowish-grey scales, which become paler half way across the mesonotum, the basal half dark brown and densely bristly. Abdomen dark brown, with violet reflections, each segment with basal white lateral patches and now and then a median yellow-scaled line, which is thickest at the bases of the segments and which spreads out over the whole of the apical segment. Legs deep brown, with bronzy reflections; fore and mid ungues equal and uniserrated in the female; in the male the fore and the mid are unequal, the larger biserrated, the small uniserrated; hind ones equal and uniserrated.

Length.—4·5 to 6 mm.

Geographical distribution.—Argentine Republic, Brazil, British Guiana, Trinidad and Jamaica. In the latter island Dr. Grabham records it from the Red Hills, Ferry and Rockfort.

Life-history and habits.—The adult occurs in a variety of places, such as the borders of overflowing streams and swamps and in woods. Dr. Low found it in jungle growth along the coast of British Guiana. It also occurs in houses. The larvae were found by Dr. Grabham in stagnant algae-containing pools of permanent water. The larval stage lasted in an aquarium exposed to the sun about eight days, the pupal stage 36 to 48 hours. The insects generally emerge between 5 and 7 p.m. The adults appear to be especially active during the afternoon and evening. I can trace no difference between the Jamaica and Brazilian specimens of specific importance. The thorax is rather more silky white in the Jamaican specimens, and the abdomen has more often the median ochraceous line than those from elsewhere.

Economic importance.—No diseases are at present known to be spread by this common species, but its bite is annoying, not only to man, but to horses and mules.

12. Culex tortilis. Theobald.

(*The Acrobat Mosquito.*)

(The Entomologist, Nov., p. 281, 1903.)

General appearance.—Head golden scaled; proboscis unbanded, deep brown. Palpi deep brown. Thorax deep brown, the middle clothed with narrow-curved golden scales, on each side in front a roundish deep brown patch, the posterior part with darker scales than the front region, being almost brown, but not so dark as the front lateral areas; pleurae pale brown, with spots of grey scales. Abdomen black in some lights, rich deep brown to dull violet in others, first segment with dusky scales forming two spots and with golden hairs; second, third, fourth and fifth segments with narrow pale yellowish basal bands, not extending quite across the segments, also basal white lateral spots most prominent on the apical segments. Legs deep brown; fore and mid ungues uniserrated, hind ones equal and simple.

Length.—4 to 4·5 mm.

Geographical distribution.—Jamaica (at Kingston).

Life-history and habits.—The life-history is so far unknown. When alive they carry their hind legs twisted right forward over their head when settled after the manner of *Wyeomyias*. They are distinct thick-set mosquitoes easily told by the thoracic ornamentation. There is considerable variation in the venation of the wings and in the amount of abdominal banding. The male is unknown.

13. Culex similis. Theobald.

(Mono. Culicid. III., p. 207, 1903.)

General appearance.—Thorax reddish-brown, with very minute dull golden-brown and a few black scales, and three double rows of black bristles; pleurae pale ochraceous, metanotum nude. Abdomen deep brown, with narrow pale basal bands, which on the last three segments spread out laterally. Legs deep brown, unbanded, coxae and venter of femora pale; ungues small, equal and simple. Wings with typical *Culex* scales, stem of first submarginal nearly half the length of the cell.

Length.—5 mm.

Nothing is known of its life-history and habits. The description is drawn up from a single perfect ♀ taken in the Red Hills to the west of Kingston, in March, 1902. It is allied to *C. fatigans*, but can be told by the absence of the two thoracic lines.

14. Culex fatigans. Wiedemann.

(*The Common Tropical or Grey Mosquito.*)

(Auss. Zweiflug. Ins., p. 10, 1828; Mono. Culicid. II., p. 151, 1901.)

General appearance.—Head brown, covered with pale gold-brown to creamy narrow-curved scales, and brownish-black and ochraceous upright forked ones, a faint pale border around the eyes. Thorax brown, covered with pale golden narrow-curved scales with two more or less distinct bare parallel lines in front. Abdomen dark brown to black, with basal white to pale creamy curved bands and white lateral spots. Legs dark brown; bases of femora and coxae paler, knee spot white and apex of tibiae with a pale spot; ungues of ♀ equal and simple, in the ♂ the fore and mid unequal, both uniserrated, hind equal and simple; stem of first fork-cell moderately long.

Length.—4·5 to 5·5 mm.

Subject to much variation in size, venation and colour.

Geographical distribution.—In most tropical and sub-tropical countries and islands, and also spreading into warmer temperate climes. This species and *S. fasciata* seem to go together.

Life-history and habits.—This is the common household mosquito of the tropics and sub-tropical countries. The larvae are found in all manner of collections of water, especially tubs, barrels, and tanks, and small collections of water, such as bottles, tins, &c. It is closely and intimately connected with man, so closely that it travels with him by sea and land, and in this way is spread from place to place and where it has never before existed. It is strictly nocturnal in habits and seldom appears to feed by day. The eggs are laid in "rafts," just as by *C. pipiens*. The larvae have not a very long siphon when adult, but when young it is long and thin. On the side the comb consists of eleven spines with five to seven rays. The antennae end in five bristly hairs, and there is a long dense lateral tuft; the spines of the pecten at the base of the siphon are simple, between fifty and sixty in number. The mentum is broad, and has upright nearly parallel bare sides, the spines of the apical border, which slopes

at an angle on each side from the apex, are simple and rounded at their ends. The pupae very similar to *Culex pipiens.*

This larva differs from *C. pipiens* in (1) the smaller range of teeth on the spines on the pecten of the tube, which vary from four to five, and in different spines on the pecten on the eighth segment.

Economic importance.—This is one of the chief agents in spreading *Filaria nocturna*, the bloodworm of man. It also acts as the intermediate host of *Filaria immitis* of dogs. Beyond acting as a disease carrier, it is a very vicious and persistent biter and draws away large quantities of blood, not only of man, but of animals and birds.

15. Melanoconion atratus. Theobald.

(*The Small Black Mosquito.*)

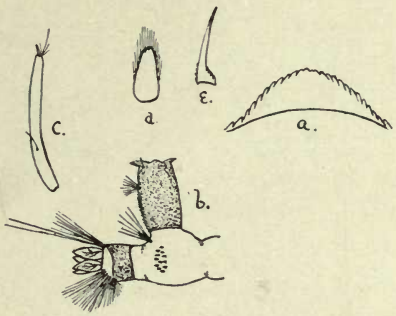
(Mono. Culicid. II., p. 55, 1901, and III., p. 238, 1903.)

General appearance.—Head with creamy-white narrow curved scales in the middle, flat ones at the sides and black upright forked scales; palpi and proboscis black. Thorax deep umber brown to almost jet black. Abdomen black, sometimes with a dull coppery-brown sheen, each segment with small lateral basal spots, most distinct on the apical segments; venter with broad creamy apical bands. Legs dark brown to almost black, except at the base, a pale knee spot and another at the tibio-metatarsal joint, female ungues equal and simple, in the male the fore and mid unequal, both uniserrated, hind equal and simple. Wings with dark brown scales, those on the apical areas of the veins short, broad and dense. Costal upper border spiny.

Length.—2·5 to 3 mm.

Geographical distribution.—Trinidad, Barbadoes, St. Lucia, Jamaica, British Guiana, Brazil. In Jamaica it is found in abundance at the Ferry Swamp and also occasionally in Kingston.

Life-history and habits.—This small black mosquito occurs in swarms in the mangrove swamps, and also is found in the bush and in hospitals and houses. Dr. Grabham says it is the usual swamp form in Jamaica. They are taken all the year round. The eggs have not been observed. The larvae live in permanent algae-containing pools and feed upon algae. Minnows frequently occur with them and do not seem to destroy them at all; nor do

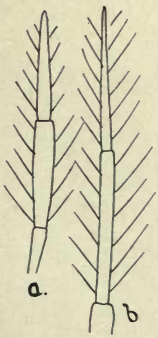


Culex taeniorhynchus. Wiedemann.

Larval characters:

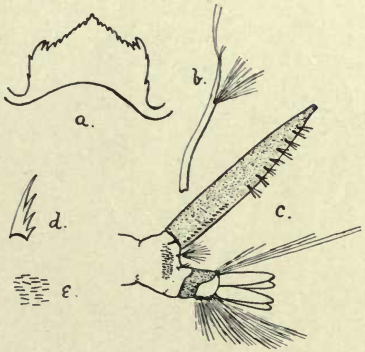
(*a*) Mentum. (*b*) Siphon and anal segments. (*c*) Antenna.
(*d*) Bristle of lateral comb. (*e*) Bristle of pecten of siphon.

FIG. 1.



Male palpi of
(*a*) *Culex janitor.* Theobald.
(*b*) *Culex secutor.* Theobald.

FIG. 2.



Culex secutor. Theobald.

Larval characters:
(*a*) Mentum. (*b*) Antenna.
(*c*) Siphon and anal segments.
(*d*) Bristle from pecten of tube.
(*e*) Bristles of lateral comb.

FIG. 3.

dragon-fly larvae. Dr. Grabham says they are easily distinguished from the larvae of other local culices by their delicate transparent outline, small size, and relatively greater length and fineness of the respiratory siphon. Dr. Low also noticed the difference in the long thin siphon.

The head is very broad, broader than the thorax, and the legs prominent; the thorax is also broader than the abdomen, and the siphon is thin and about two-thirds the length of the abdomen. In colour they are often bright green.

The pupae have very long cylindrical siphons, and are green in colour; in life the upper two-thirds of the siphons are black or dark grey, in striking contrast to the rest of the body of the pupa, which is very transparent, especially just after metamorphosis, only the eye-spots and siphons being pigmented.

Economic importance.—This small black mosquito is a most troublesome pest in swamps, especially in the local mangrove swamps around Kingston; but it also invades houses where, on account of its small size, ordinary mosquito-netting is of no protection against it. The female bites at all times of the day and night, the bites causing very severe irritation. The same species does not appear to annoy man in Brazil.

16. Grabhamia jamaicensis. Theobald.

(Mono. Culicid. I., p. 345, 1901, and III., p. 243, 1903.)

General appearance.—Head brown, with narrow-curved cinereous scales and black upright forked ones, flat black and white ones laterally; palpi brown, with some yellowish scales, apex white; proboscis black at the tip and base, the middle with yellowish scales. Thorax dark brown, with four patches of creamy scales, the median ones round, the others oval; there are also pale scales before the scutellum. Abdomen dark brown, with pale-scaled apical bands, those of the second segment forming a triangular patch, the next four with patches broken in the middle; apical segment mostly black; venter yellow scaled. Legs brown, banded and speckled with yellowish scales; some of the tarsi basally banded white, a distinct band on the middle of the metatarsi and a pale apical femoral ring.

Wings with black and white or creamy scales, a small patch of black scales forming a spot at the base of the third long vein; ungues of the female equal and simple; in the male the fore and mid are unequal, the larger fore unguis is biserrated, the smaller

uniserrated; in the mid the larger claw has one small tooth, and the smaller is simple; hind ungues equal and simple.

Length.—5·5 mm.

Geographical distribution.—Southern States of North America and Jamaica.

Life-history and habits.—This very distinct species is apparently not common in Jamaica; the specimens sent me were taken in December and bred from larvae caught along the Spanish Town Road, Kingston.

The life-history has been worked out by Professor G. W. Herrick.* He first noticed the larvae in an open sewage drain at the College Campus of the Agricultural College, Mississippi, in 1901, and again scores in a roadside pool near Starkville. At first sight they might be mistaken for *Anopheles* owing to their horizontal position in the water. They lie just below the surface film. Rain-water pools of transient nature seem their favourite abode, those found in the sewage ditch being exceptional.

When the larva rises to the surface it assumes at first the position of a *Culex*, but after a moment, if left undisturbed, the body with a slight jerk floats quickly to an approximately horizontal position, with the head on a level with the surface of the water. It differs from *Anopheles* in this respect, however, like a piece of slack rope, curved down between the head and respiratory tube. The tube projects at least a third of its length out of the water. They are constantly swimming about in a backward direction. The anal filaments are much longer and more slender than in *Culex*. Professor Herrick says the respiratory tube is much longer than in *Culex fatigans*. The figure does not show this, and a character of this genus is the short larval siphon. The antennae have a small lateral tuft towards the apex. The comb on the eighth segment is composed of conspicuously toothed spines joined on a weak basal segment. The pupae are large and are figured with long siphons, with two tiers at the truncated end. This stage lasts, according to Professor Herrick, forty-eight hours. The eggs are laid singly, as observed by Dr. Grabham, and are possibly, as in *G. sollicitans*, laid on dry mud or moist soil, and await the coming of rain. The eggs of *G. dorsalis* can withstand desiccation some months, and hatch out at once when placed in water. This habit of laying eggs on dry or drying mud in places likely to catch water and so form pools is apparently common to the members of this very distinct genus.

* Entomological News, p. 81, March, 1904.

17. GRABHAMIA PYGMAEA. Theobald.*

(Mono. Culicid. III., p. 245, 1903.)

General appearance.—Somewhat like the former, but much smaller, and the thorax creamy scaled, with two dark median spots and a median dark line in front and a zigzag line around the two spots in front and on the inner side. The metatarsi show no trace of median banding, and there is no trace of a spot at the base of the third long vein, and the wing scales are shorter and rather broader than in *G. jamaicensis.* The abdomen and remainder very similar to the former species. The apical abdominal bands are not divided except on the hindermost segments. Thoracic ornamentation very variable; one specimen had pronounced dark-scaled areas.

Geographical distribution.—Antigua and Jamaica.

Life-history and habits.—The following notes and figures were sent me by Dr. Grabham: "Two gorged specimens, captured on a horse and introduced into breeding jars. A few eggs were laid about thirty-six hours afterwards. The insects were then killed and pinned. The eggs were deposited like those of the type, separately on the surface of the water. They were comparatively large, about $\frac{3}{4}$ mm. long, and somewhat narrow and covered with hollow papillae curved at their apices towards the narrow end of the ovum. The air chambers are quite different to those in *Stegomyia fasciata* ova. The larvae hatched out two days afterwards and were fully grown in eight days. The appearance of the last three abdominal segments of the adult larva as in the figure. Anal papillae, lanceolate, acuminate, as long as the longest posterior hairs. A short chitinous collar around the posterior half of the ninth segment strengthened on the under surface by transverse bars. A pair of tufts of hairs spring from the upper surface and eight to nine pairs from the ventral surface. Respiratory siphon a little more than twice as long as broad. At each of the postero-lateral margins a row of four short, two to four branched, bristles. A pair of compound plumose hairs at the upper border of the eighth segment, each hair with six to seven trichae. A row of compound bristles at the postero-lateral margin of the eighth segment, composed of

* Colonel Giles, late I.M.S., has recently described this very marked *Grabhamia* as a new *Taeniorhynchus*—*T. antiguae*—in the Journal of Tropical Medicine. The type is in the British Museum, and I have had it placed in its true position.

six to seven claw-shaped bristles, each with five to six stout highly chitinised curved denticles. The long hairs on the thorax, especially those on the posterior groups, are plumose. Lower lip of Meinert with twelve to sixteen teeth on each side. The adult larva seen in breeding jar has two dark olive-green spots on the upper surface of the sixth segment. Antennae truncate, lateral tuft of a few hairs (sometimes only one). A few short terminal hairs. The pupal stage lasted about thirty-two hours."

18. Grabhamia sollicitans. Walker.
(*The White-banded Salt Marsh Mosquito*).

(Insect. Saund., p. 427, 1856; Mono. Culicid. I., p. 368, 1901, and III., p. 247, 1903.)

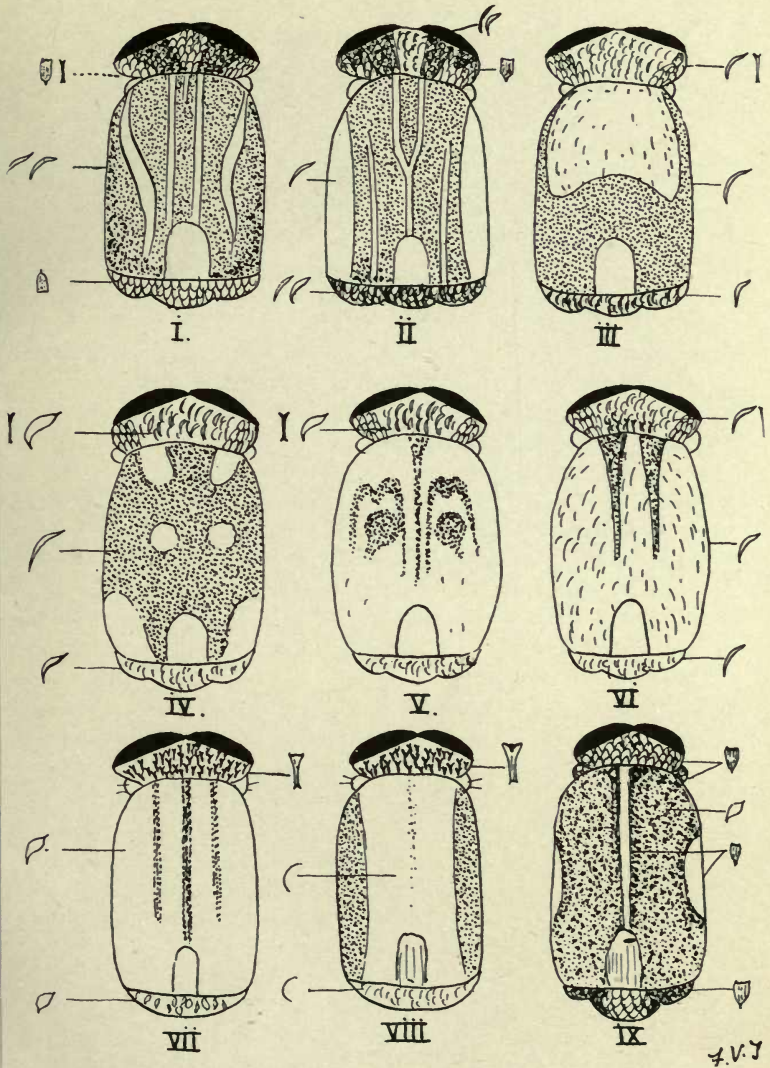
General appearance.—Head brown, with dense golden, narrow curved scales, with flat ochraceous ones at the sides; palpi with dark scales and a white apex; proboscis black, with a distinct yellowish-white median band. Thorax covered with thin narrow curved yellow golden scales; pleurae with dense white scales Abdomen clothed with creamy-white to yellow scales, which form a broad central line, and with basal white bands and white lateral spots, with a dark quadrangular patch on each side on most of the segments; venter with pale creamy scales. Legs ochraceous, mottled with black and white scales; knee spots white; fore metatarsi without a basal white band, mid and hind metatarsi with a pale basal band, quite white in the hind legs and with two blackish bands, one apical; mid and fore tarsi with a broad white basal band except on the last joint, which is pale; in the hind legs the bands are broader and whiter and the last segment is all white. Wing scales mottled; fork-cells short.

Length.—5·5 to 6 mm.

Geographical distribution.—Along the littoral of North America; Galapago Islands; Tamsui; Formosa and Jamaica. Somewhat rare in Jamaica.

*Life-history and habits.**—This well-marked species inhabits the salt marshes along the North American coast, and especially along the bays and near the mouths of rivers where they empty into salt water. The adults migrate some distance inland far from their breeding grounds. The larvae occur in very brackish water and even salt water. Now and then they are also found

* New Jersey Agri. Exp. Station, Bull. 171, Feb. 8, 1904, p. 17, J. B. Smith; and a special Bulletin, T, July 8, 1902, The Salt Marsh Mosquito, p. 8.



HEADS AND THORACES OF JAMAICAN CULICIDAE.

I. *Stegomyia fasciata.* Fabricius.
II. *Howardina Walkeri.* Theobald.
III. *Culex confirmatus.* Arribalzaga.
IV. *Grabhamia jamaicensis.* Theobald.
V. *G. pygmaea.* Theobald.
VI. *Culex secutor.* Theobald.
VII. *Cellia albipes.* Theobald.
VIII. *Anopheles punctipennis.* Say.
IX. *Uranotaenia socialis.* Theobald.

in freshwater pools on the salt marshes. They never seem to breed in land or in purely fresh water swamps.

The eggs are laid singly, white when first deposited, but become black like *G. dorsalis*; they are spindle-shaped, rather broadened at one end. As many as 200 may be laid by each female. The eggs are laid on mud, both moist and dry, never, it seems, in the water. The eggs remain dormant all the winter and hatch out in the spring, when the water flows into the muddy hollows where they were laid. This usually takes place in North America about March, and the first brood mature about May. The females from this brood lay eggs a few days after hatching in the muddy depressions left by drying pools and tidal pools. They can remain in this position three months. It appears that the eggs must become dry or nearly so for three or four days before they can hatch. The larvae are dirty grey to whitish, head yellow, with or without diffused blotches; respiratory siphon short, stout and brown. The antennae are somewhat darkened apically, taper gradually to a truncated apex with four spines. Halfway up the antennae is a hair tuft of four longish hairs, and there are a few scattered short spines; the scales of the pecten are broad basally, suddenly constricting to a fine point, with a row of seven spines on each side; the siphon has a row of spines on the lower aspect of its basal half, the spines being long, thin and with one or more teeth on one side.

The larval life varies from seven to ten days.

The pupal stage lasts from one to three days. The pupae are provided with siphons having very oblique openings, the apices being swollen and the broad anal plates with the central rachis projecting well beyond their edges.

Economic importance.—This marsh mosquito is a very vicious biter and causes much annoyance in the towns along the New Jersey coast line and other littoral regions of North America. So far it has not been shown to be connected with any mosquito-borne disease.

19. Mansonia titillans. Walker.
(*The Riverside Mosquito*).

(Brit. Mus. List, p. 3, Walker; Dipt. Argentina, p. 48, Arribalzaga (*Taeniorhynchus taeniorhynchus*); Mono. Culicid. II., p. 175, 1901, and III., p. 269, 1903.)

General appearance.—Head brown, with grey scales and black, upright forked ones; palpi yellowish, with dark scales and

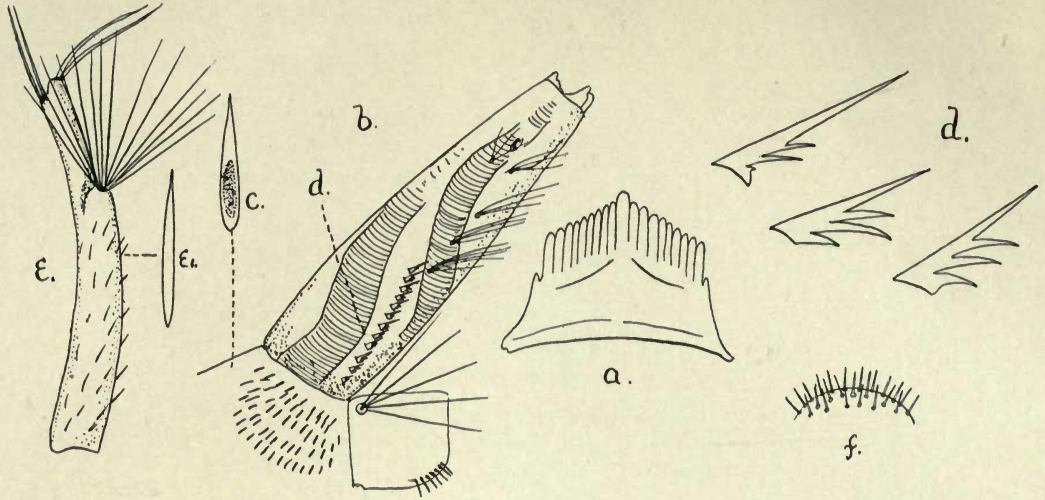
a few white ones, apex white; proboscis yellowish-brown, a little dark at the base and very dark at the apex, in fact, broadly pale banded in the middle. Thorax brown, with scattered brown narrow-curved scales and a few golden ones in lines, long black scales and bristles over the roots of the wings. Abdomen dusky-brown, with yellow scales laterally, ochraceous ventrally and sometimes with white scales on the apical borders and the sides. Legs yellowish-brown, with ochraceous and dark scales; tarsi basally pale banded; ungues of the female equal and simple. Wings densely scaled, with broad brown and creamy scales. In the male the fore and mid ungues are unequal. The larger uniserrated, the smaller simple, hind ones equal and simple.

Length.—5 to 5·5 mm.

Geographical distribution.—Generally over the northern part of South America, through Brazil to the Argentine, in the southern states of North America and in Trinidad, Antigua and Jamaica. Apparently uncommon in Jamaica.

Life-history and habits.—This common South American species has, as far as I know, not had its life-history worked out. It is a large and conspicuous insect which is subject to much variation. It is limited in Brazil largely to river sides and swamps fed by running water. It follows the course of the large South American rivers, but also occurs in numbers on the littoral. It inhabits the banks of the Parana, and is present in great numbers in March and April, and visits houses in numbers. It apparently does not like thickly-populated places, and, although common around, is rare in Buenos Ayres and its suburbs. It occurs also in November in Brazil, and in abundance along the course of the Amazon. The eggs are probably like those of the allied African and Indian species (*uniformis*), and are laid singly. The pupa and larva are unknown also; at least, have not been described. The *M. uniformis* has a pupa of rather marked character, the siphons being long and curved and ending acuminately, and the anal plates are elongated and oval, notched at the apex, and the abdominal segments are much constricted and have dorsal median spines.

Economic importance.—The bite of this riverside mosquito is very painful; its saliva is distinctly acid. Probably it can act as an intermediate host of filariae.



Culex fatigans. Wiedemann.

Larval characters :

(*a*) Mentum. (*b*) Siphon and basal segments. (*c*) Basal spines (lateral comb). (*d*) Pecten spines of siphon. (*e*) Antenna. (e_1) Bristle of antenna. (*f*) Clypeus.

20. URANOTAENIA SOCIALIS. Theobald.

(*The Jamaican Uranotaenia.*)

(Mono. Culicid. II., p. 340, 1901.)

General appearance.—Head dark, covered with flat black scales, and metallic blue ones bordering the edges in the middle; palpi small, brown; proboscis black, swollen apically. Thorax brown, with a yellowish chestnut tinge, with very small bronzy brown scales, a median row of small flat blue to mauve scales ending at the bare space in front of the scutellum, a similar coloured patch in front of the root of each wing and a small median one on the scutellum; prothoracic lobes blue. Abdomen black, unbanded, sometimes showing a pearly patch on the apex of the fifth and sixth segments. Legs black, unbanded, with a white knee spot and another at the apex of the tibiae. Wings with a pale blue tint at the root of the fifth long vein. Male ungues of the fore legs very slightly unequal, small and simple; of the mid very unequal, sickle-shaped and simple; hind smaller, nearly equal, and simple.

Length.—2 mm.

Geographical distribution.—So far only recorded from Jamaica.

Life-history and habits.—The life-history does not seem to be known. Dr. Grabham found the larvae in association with *Anopheles* larvae in some stagnant permanent pools about the Kingston district, and was unable to get the adults to bite.

21. DEINOCERITES CANCER. Theobald.

(*The Crab-hole Mosquito.*)

(Mono. Culicid. II., p. 215, 1901, and III., p. 275, 1903.)

General appearance.—Head blackish-brown, with grey narrow curved scales, with a dull creamy tinge in front, ochraceous and pale brown upright forked scales; palpi brown, with a few grey scales; proboscis brown, black apically, apex expanded. Antennae long, the second segment as long as the three following, second segment with small brown scales; in the male the antennae are very long, considerably longer than the whole body, pilose, not plumose, as in all the preceding *Culicidae*. The second segment is equal in length to two of the following segments. Thorax black, paler towards the scutellum, covered with narrow curved bronzy scales which have a greyish tinge in certain lights. Abdomen steely black, with deep umber-brown scales with violet reflections, no trace of bands or lateral spots. Legs unbanded, brown, with bronzy and yellowish reflections; ungues of female

small, equal and simple; in the male the fore and mid legs have unequal ungues, the larger in both uniserrated, the smaller simple; hind ones rather long, thin, curved and simple.

Length.—4 to 5 mm.

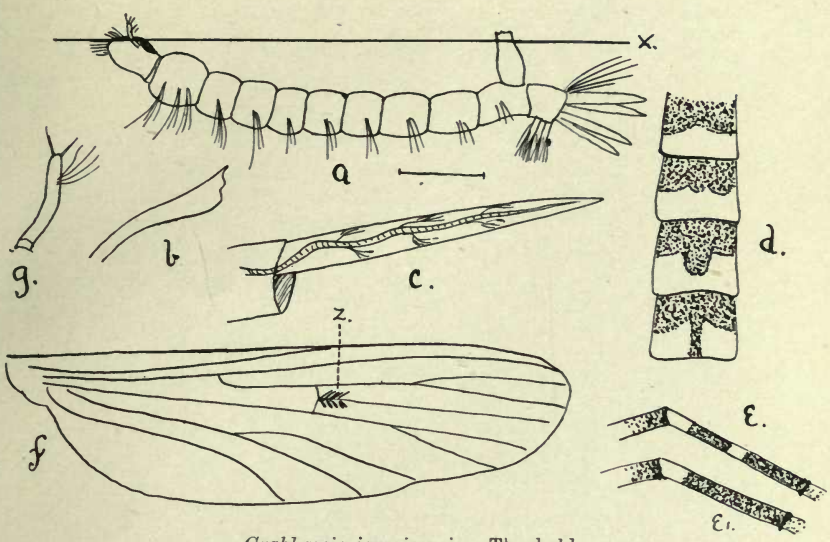
Geographical distribution.—St. Vincent, St. Lucia, Barbadoes, Jamaica and British Guiana.

Life-history and habits.—This is a "crab-hole" breeding form, the water in which they occur being brackish. The larvae occur at the bottom of these crab-holes, near the sea. The crab-holes are long winding passages, sometimes three or four feet long and only about four inches in diameter. The live insects hold their long antennae stiffly out in front, somewhat arched downwards and kept in constant movement exploring the surface as the insect crawls. At the end of the second joint are a number of peculiar sense organs (Giles) which are probably olfactory organs. They are sluggish in flight, and, when disturbed, Dr. Low noticed that they fly slowly from one hole to another. The eggs are not known. The larvae are grey with a dark median line, chestnut-brown head and brown siphons, which are thick and as long as the two preceding segments and the one on which they are situated. In the adult larva, Dr. Grabham says, the siphon is nearly cylindrical, many times longer than broad; the pecten composed of six to seven deeply bifid or trifid bristles, a pair of long bifurcated hairs about the middle and a pair of short simple hairs below the free end.

Lateral comb of the eighth segment composed of numerous simple curved bristles, the posterior the longer. There are trifid plumose hairs below the base of the siphon. The ninth segment has a chitinous dorsal plate as shown in the figure. Anal papillae reduced to two curved lateral lobes. Ventral chitinous plate small, mentum with fifteen to twenty bifurcated teeth. Antennae with a median tuft of four to six hairs, and on the apex two long and two short hairs and two spines. The first thoracic segment has numerous simple hairs in front and two pairs of bunches of plumose hairs arising from conical papillae on each side; the second segment has four lateral hairs, two long and plumose and two short, the third to sixth with a pair of finely plumose hairs on each side, the seventh with a single long hair. The length of the siphon varies according to age.

Length.—6 mm.

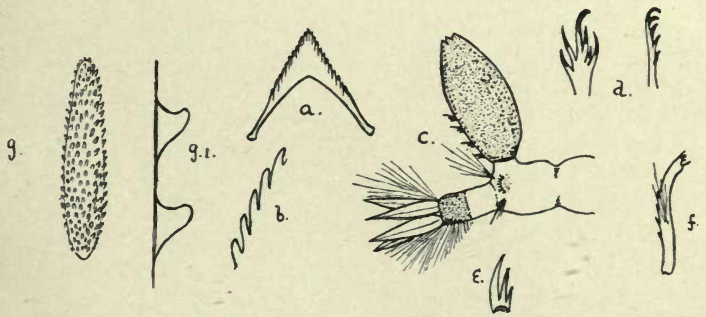
The pupa has truncated siphons and two anal fins. The length of the various stages is not known.



Grabhamia jamaicensis. Theobald.

(*a*) Larva in position in water (x water level). (*b*) Pupal siphon. (*c*) Anal filament of larva. (*d*) Abdominal segments of male. (*e*) Hind metatarsus of *G. jamaicensis* (e_1) of *G. pygmaea*. (*f*) Wing of ♀, showing spot (z). (*g*) Larval antenna (partly after Herrick).

FIG. 1.



Grabhamia pygmaea. Theobald.

Larval characters:

(*a*) Mentum. (*b*) Enlarged teeth of same. (*c*) Siphon and anal segments. (*d*) Bristles of comb of basal segment. (*e*) Bristle of pecten of tube. (*f*) Antenna. (*g*) Egg. (g_1) Enlarged papillae of egg shell.

FIG. 2.

22. Haemagogus equinus. Theobald.

(*The Jamaican Haemagogus.*)

(The Entomologist, p. 282, 1903.)

General appearance.—Head metallic violet, white between the eyes in front; palpi and proboscis black; antennae pale brown. Thorax metallic green, pleurae snowy white. Abdomen bright metallic violet, with three prominent and one faint silvery white basal bands and white lateral spots. Legs unbanded, deep brown, femora white beneath. Wings with violet reflections, iridescent.

Length.—4 to 5 mm.

Geographical distribution.—Jamaica.

Life-history and habits.—This brilliant species was taken by Dr. Grabham on a horse, in August, at the lower end of the Old Pound Road, St. Andrews, at 7 p.m. It is evidently an uncommon insect. Nothing is known of its life-history.

23. Dendromyia Mitchellii. Nov. sp.

Head deep brown, with grey scales at the sides; proboscis and palpi deep brown; antennae brown. Thorax deep shiny brown, clothed with deep brown scales; pleurae bright ochraceous, with patches of silvery white scales. Abdomen deep blackish, with grey or creamy venter; unbanded and unspotted; apex dark ventrally, with black bristles; legs long and thin, deep brown, except one side of the last three mid tarsi (and the tip of the fourth, which is black), and the apex of the first, which are shiny silvery white. Wings with brown scales; fork-cells long.

♀. Head deep brown, clothed with flat deep-brown scales, except around the eyes, where there is a broad border of grey scales showing violet reflections, and at the sides, and also a creamy patch in the middle in front; a few curved black bristles project forward over the eyes. Proboscis deep blackish brown, nearly as long as the abdomen, slightly swollen apically. Palpi deep blackish brown, with short black bristles, about one-eighth the length of the proboscis; antennae deep brown, with long dark verticillate hairs and grey pubescence on the internodes. Eyes black (in the dead insect). Thorax deep shiny black, clothed with irregularly disposed, bronzy-black, flat, spindle-shaped scales and large, flat, spatulate ones with dull violet reflections over the roots of the wings, and deep brown bristles; there are

also large, flat scales before the scutellum. A few grey scales in front over the head; prothoracic lobes clothed with small, flat, brown scales above, with dull silvery white ones below; a patch of small, flat, silvery-white scales on each side of the mesonotum in front, scarcely showing in the dorsal view; scutellum testaceous, clothed with small, flat, dull brownish violet, spatulate scales and brown border-bristles; metanotum deep to bright brown according to the light, with a few chaetae arising from black spots towards its apex; pleurae ochraceous, with patches of small, white, flat scales.

Abdomen blackish, the scales showing dull violet reflections, border-bristles very small and pallid; venter entirely clothed with dull white scales and a few black ones apically, and with many straight black bristles at the apex.

Legs long and thin, deep blackish brown with bronzy reflections, the hind femora dilated apically, the last three mid tarsi and the apex of the first silvery white on one side, except just at the apex of the last segment; ungues small, equal and simple. Wings with brown scales, those on the apex of the two branches of the second long vein slightly broadened, some of the other lateral vein-scales long and rather thin, especially on the stem of the second and on the fourth; first sub-marginal cell considerably longer and a little narrower than the second porterior cell, its base nearer the base of the wing than that of the latter cell, its stem about one-third the length of the cell; stem of the second posterior cell about two-thirds the length of the cell; posterior cross-vein longer than the mid cross-vein, about half its own length distant from it; mid and supernumerary cross-veins almost in a straight line. Halteres with pale ochraceous stem and fuscous knob.

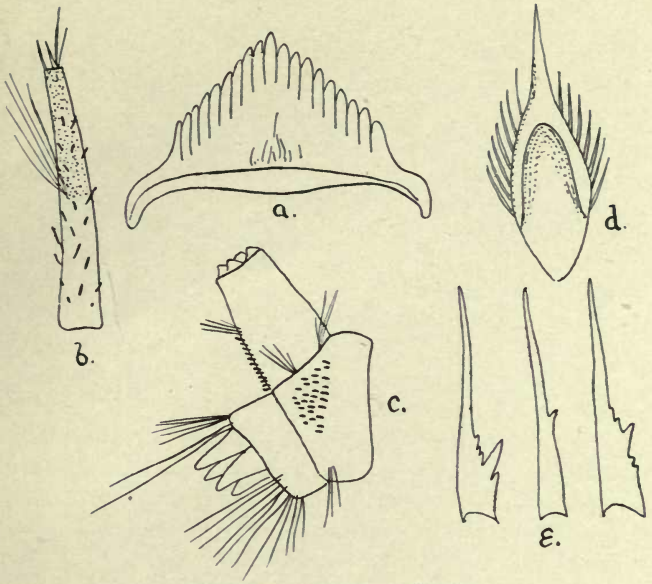
Length.—4 mm.

Time of capture.—January (1904).

Habitat.—Jamaica.

Observations.—Described from a single perfect female taken by Dr. Grabham. It can at once be identified by the white mid tarsi. This appears to be on one side only, apparently the upper surface.

It can be at once told from the other species by the above character and the cephalic adornment. No special notes have been made on this insect. There are more lateral linear scales to the wings than in the type of the genus, but it more nearly approaches *Dendromyia* than *Wyeomyia*.

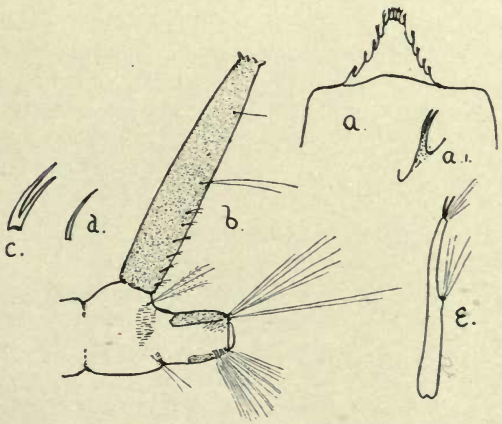


Grabhamia sollicitans. Walker.

Larval characters:

(*a*) Mentum. (*b*) Antenna. (*c*) Siphon and anal segments.
(*d*) Spine from lateral comb. (*e*) Spines from pecten of tube.

FIG. 1.



Deinocerites cancer. Theobald.

Larval characters:

(*a*) Mentum. (a_1) A process of mentum. (*b*) Siphon and anal segments.
(*c*) Spine from pecten of siphon. (*d*) Spine from lateral comb. (*e*) Antenna.

FIG. 2.

APPENDIX.

The following species also occurs in Jamaica.

WYEOMYIA GRAYII. Theobald.

Aedes perturbans. Williston (?).

(Mono. Culicid. II., p. 269, 1901, and III., p. 310, 1903.)

General description.—Thorax testaceous brown, with dusky scales; pleurae ochraceous, densely clothed in parts with broad white scales. Abdomen dusky black above; venter ochraceous. Legs black; coxae and venter of the femora ochraceous; ungues of the female equal and simple; metanotum with four chaetae placed quadrangularly; proboscis not quite as long as thorax and abdomen.

Observations.—A delicate spider-like mosquito resembling *Dendromyia Mitchellii*, Theobald, to which it is closely allied. When settled it throws its hind legs right forward over its head. It is a vicious biter. Found by Dr. Grabham in the Red Hills and Bath Botanic Gardens. Nothing is known of the male or larvae, all attempts to breed it in captivity having failed.

Length.—Body, 3 to 3·5 mm.; hind legs 8·5 mm.

NOTE ON GRABHAMIA JAMAICENSIS. Theobald.

Dr. Grabham has lately bred this species, and notes the following points. The ovum closely resembles that of *G. pygmaea*, Theobald, differing only in the shape of the papillae, which are pointed. The larvae of these two species are also much alike; in a number of full-grown specimens which were examined the spines of the comb on the eighth segment were digitately three-spined, with a number of intervening weaker bristles. The spines of the pecten on the siphon were in two rows of three each. In *G. pygmaea* each row contained four or five spines. No points of specific importance were noted in the pupa.

NOTES ON LARVA AND PUPA OF URANOTAENIA LOWII. Theobald.

Two small delicate larvae, collected from a pool covered with *Marsilia polycarpa*, Hooker, in a ditch near the bridge over the Rio Cobre Canal, Old Harbour Road, Spanish Town, Jamaica. Found in association with *Culex fatigans*, Wiedemann, and *Cellia albipes*, Theobald, January 1st, 1905.

Seen in the breeding-jar, the larvae assumed a horizontal position just below the surface film, the extremity of the siphon alone being in contact with the surface film. They moved forward in sharp jerks quite unlike any other Jamaican Culicid.

Head.—Very dark brown, almost black; antennae short, no lateral tuft; shaft with a few short spines; terminal spines three, are somewhat longer than the others, about two-thirds the length of shaft; an ovate lamina between the spines; mentum with seven rounded teeth.

Thoracic and anterior abdominal hairs feathered; posterior abdominal hairs simple; a number of tufted hairs on the abdominal segments in addition to the lateral hairs; no tufted hairs observed on the thorax. Rays of tufts few, long, slender.

Tube.—Sub-cylindrical, five times as long as broad: pair of tufted hairs in the middle of the posterior border. Pecten of tube with double row of twelve to fifteen scales; scales very thin, laminae bordered with many fine hairs (much longer than serrations figured by Felt, New York State Museum, Bull. 79, Ent. 22, p. 344, 1904, in *U. sapphirina*, Osten Sacken). Row of pecten scales reach from the base of tube up to level of tufted hairs. Upper scales overlap one another.

Comb of eighth segment, an irregular row of eight to nine simple curved spines springing from a chitinous plate.

Chitinous collar completely encircling ninth segment. Dorsal and ventral tufts of hairs spring from oval chitinous plates attached to collar by narrow isthmuses (similar plates are figured by Felt in *U. sapphirina*, Osten Sacken).

Anal papillae long, slender, divergent.

Pupa.—Thorax and abdomen with scattered tufted hairs. Siphons sub-cylindrical, about eight times as long as broad; bases deeply chitinised. Fins acuminate, midrib not projecting beyond border. Borders deeply serrated; two halves of fins very unequal.

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